University of Tor Vergata
Ph.D. in Economics and Finance
2021-2022

Topics in Auction Theory
November 29 and 30
December 1, 2, 3, 6 and 7
(check the calendar for time)

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Overview

This course introduces the foundations of auction theory and mechanism design. In the first part, it presents the basic methodology of auction theory and examines some classical auction formats, namely, first-price and second-price sealed-bid auctions. It derives their main equilibrium characterization and shows that the two auction formats equally performs from the viewpoint of the seller. It then generalizes this performance result to a wide range of auction formats generally known as the "Revenue equivalence principle" and investigates which assumptions ensure that it holds or fails to apply.

In the second part, the course goes beyond the investigation of particular auction formats and presents the general mechanism design problem faced by the seller. It introduces general selling mechanisms, the revelation principle and derives the optimal mechanism in a private value setting. Finally, it considers efficient mechanisms, that is, mechanisms whose goal is to ensure an efficient allocation rather than maximizing the seller's revenue.

Prerequisite

For mathematical convenience, the course will almost always assume continuous type spaces. Basic knowledge of calculus, integration, simple differential equations and envelope theorems is required. It is also assumed that students are familiar with probability theory and fundamentals of game theory. If you need a refresher in maths or in game theory, I would advise the following references.

Carter, M. (2001). Foundations of mathematical economics. MIT Press.

Fudenberg, D., & Tirole, J. (1991). Game theory. MIT press.

Osborne, M. J., & Rubinstein, A. (1994). A course in game theory. MIT press.

Detailed topics

First-price and second-price sealed-bid auctions: Setting, equilibrium strategies and seller's revenue. Reserve prices and revenue. Open auctions (English and Dutch).

Revenue equivalence principle. Risk-averse bidders, financially constrained bidders, asymmetric valuations, common value environment.

General selling mechanisms. The Revelation Principle. Incentive compatibility, individual rationality and the optimal mechanism. Efficiency versus revenue maximization. Budget balanced efficient mechanisms and application to bilateral trading: An impossibility result. Partnerships: A possibility result.

Readings

Useful readings for the course.

Börgers, T., & Krahmer, D. (2015). An introduction to the theory of mechanism design. Oxford University Press, USA.

(non-technical) **Klemperer, P.** (2004). Auctions: theory and practice. Princeton University Press.

McAfee, R. P., & McMillan, J. (1987). Auctions and bidding. Journal of economic literature, 25(2), 699-738.

Myerson, R. B. (1981). Optimal auction design. Mathematics of operations research, 6(1), 58-73.

Myerson, R. B., & Satterthwaite, M. A. (1983). Efficient mechanisms for bilateral trading. Journal of economic theory, 29(2), 265-281.

Krishna, V. (2002). Auction theory. Academic press.

If you are interested in those topics, here are some seminal/more advanced references on auctions an mechanism design. More on request!

d'Aspremont, C., & Gérard-Varet, L. A. (1979). Incentives and incomplete information. Journal of Public economics, 11(1), 25-45.

Baron, D. P., & Myerson, R. B. (1982). Regulating a monopolist with unknown costs. Econometrica: Journal of the Econometric Society, 911-930.

Boyd, S., Boyd, S. P., & Vandenberghe, L. (2004). Convex optimization. Cambridge university press.

Cramton, P., Gibbons, R., & Klemperer, P. (1987). Dissolving a partnership efficiently. Econometrica: Journal of the Econometric Society, 615-632.

Graham, D. A., & Marshall, R. C. (1987). Collusive bidder behavior at single-object second-price and English auctions. Journal of Political economy, 95(6), 1217-1239.

Makowski, L., & Mezzetti, C. (1994). Bayesian and weakly robust first best mechanisms: characterizations. Journal of Economic Theory, 64(2), 500-519.

Milgrom, P., & Segal, I. (2002). Envelope theorems for arbitrary choice sets. Econometrica, 70(2), 583-601.

Milgrom, P. R., & Weber, R. J. (1982). A theory of auctions and competitive bidding. Econometrica: Journal of the Econometric Society, 1089-1122.